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09/728,373	11/28/2000	Ting K. Yee	5169 US	3475

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EXAMINER	
KIM, DAVID S	

ART UNIT	PAPER NUMBER
2633	11

DATE MAILED: 03/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No.	Applicant(s)	
	09/728,373	YEE ET AL.	
	Examiner	Art Unit	
	David S. Kim	2633	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 28 November 2000.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-31 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-31 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 28 November 2000 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 4 and 6-10.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statement filed on 10 April 2001 (Paper No. 4) fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each U.S. and foreign patent; each publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but all the information referred to therein has not been considered. Examiner considered the information documents that were readily accessible, such as patents and journal documents that are available through online access. The other documents have not been considered; these documents are indicated by a lack of Examiner's initials next to the document listings. Should Applicant desire the consideration of these documents by Examiner, Applicant is advised to send a legible copy of each of these documents to the Office.

Drawings

2. The drawings are objected to because of the following minor informalities:

In Fig. 2, reference character "200" is missing. See p. 7, line 12.

In Fig. 12, reference characters "1223B," "1224C" (see p. 22), "1235B," "1235C" (see p. 23), "1252B," "1252C" (see p. 24), "1253B," "1253C," "1253D" (see p. 24), "1254B," and "1254C" (see p. 24) are missing.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

3. The disclosure is objected to because of the following informalities:

On p. 6, lines 23-24, "optical local oscillator" is used where "optical local oscillator signal" may be intended.

On p. 19, line 10, "1:N power combiners" is used where "N:1 power combiners" may be intended.

Appropriate correction is required.

Claim Objections

4. **Claims 2, 16, and 18** are objected to because of the following informalities:

In claim 2, line 2, "subband" is used where "optical signal" may be intended. See p. 24, lines 4-5.

In claim 16, "subbands" is used where "optical signals" may be intended. See p. 19.

In claim 18, line 8, "receiving an optical local oscillator" is used where "receiving a signal from an optical local oscillator signal" may be intended.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. **Claims 1-9, 12, 15, 18-24, 28, and 31** are rejected under 35 U.S.C. 103(a) as being unpatentable over Sargis et al. ("10-Gb/s subcarrier multiplexed transmission over 490 km of ordinary single-mode fiber without dispersion compensation") in view of Tsushima et al. (U.S. Patent No. 5,140,453) and Glance ("WDM coherent optical star network").

Regarding claim 1, Sargis et al. discloses:

An optical communications system for communicating information comprising:

a receiver subsystem (Fig. 1, receiver side) comprising:

an optical splitter (optical splitter in Fig. 1) for splitting a composite optical signal having at least two subbands (note bands around subcarriers in Fig. 1) of information and at least one tone (optical carrier and subcarriers in Fig. 1) into at least two optical signals, each optical signal (output signals from filters in Fig. 1) including a different one of the subbands and one of the tones; and

at least two receivers (receivers in Fig. 1), each receiver coupled to receive one of the optical signals from the optical splitter for recovering information from the subband contained in the optical signal.

Sargis et al. does not expressly disclose:

said receivers comprising heterodyne receivers, each heterodyne receiver comprising:

a heterodyne detector for mixing an optical local oscillator signal with the optical signal to produce an electrical signal which includes a frequency down-shifted version of the subband and the tone of the optical signal; and

a signal extractor coupled to the heterodyne detector for mixing the frequency down-shifted subband with the frequency down-shifted tone to produce a frequency component containing the information.

However, heterodyne receivers are extremely common and conventional in this field of art. Tsushima et al. and Glance both teach examples of heterodyne receivers. Tsushima et al. teaches an apparatus that fits the receiver disclosure in claim 1 (Tsushima et al., Fig. 1). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to modify the system of Sargis et al. with heterodyne receivers, such as those in Tsushima et al. and Glance. One of ordinary skill in the art would have been motivated to do this since it is well known that heterodyne receivers operate via coherent detection, and "coherent detection yields high-receiver sensitivity and high-frequency selectivity" (Glance, p. 67, middle of col. 1).

Regarding claims 2 and 4, Sargis et al. in view of Tsushima et al. and Glance does not expressly disclose:

The optical communications system of claim 1 wherein the optical splitter includes a separate splitter for separating each optical signal from the composite signal (claim 2), or

The optical communications system of claim 1 wherein the optical splitter includes a wavelength division demultiplexer for wavelength division demultiplexing the composite optical signal into the optical signals (claim 4).

However, these splitter limitations are all common and well known in the art, and both perform the same function of isolating a desired optical signal from a composite signal. Also, Sargis et al. in view of Tsushima et al. and Glance teaches an apparatus (splitter and filters in Fig. 1) that performs the same function. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to implement this isolating function according to the splitter limitations of claims 2 or 4. One of ordinary skill in the art would have been motivated to do this since they offer common, additional options for implementing the same function, thus providing design and manufacturing flexibility. Moreover, these rejections are made in view of the recognition that these limitations do not constitute the thrust of the

inventive concepts of Applicant's invention. Rather, they comprise common expedients of a well-known technical function in the art.

Regarding claim 3, Sargis et al. in view of Tsushima et al. and Glance discloses:

The optical communications system of claim 1 wherein the optical splitter includes an optical power splitter (optical splitter in Fig. 1) for splitting the composite optical signal into optical signals which are substantially the same in spectral shape (optical splitters conventionally split the input signal into multiple copies of the input signal, each copy having a reduced power level).

Regarding claim 5, Sargis et al. in view of Tsushima et al. and Glance discloses:

The optical communications system of claim 1 wherein the optical splitter includes a wavelength-selective optical power splitter (optical splitter and filters in Fig. 1) for splitting the composite optical signal into optical signals, each optical signal including a different primary subband and attenuated other subbands.

Regarding claim 6, Sargis et al. in view of Tsushima et al. and Glance discloses:

The optical communications system of claim 1 wherein:

the electrical signal further comprises direct detection components (Glance, Fig. 1); and

the frequency down-shifted version (Glance, selected channel in IF domain in Fig. 1) of the subband does not spectrally overlap with the direct detection components.

Regarding claim 7, Sargis et al. in view of Tsushima et al. and Glance discloses:

The optical communications system of claim 1 wherein the heterodyne detector comprises:

an optical combiner (Tsushima et al., optical combiner in Fig. 1) for combining the optical local oscillator signal and the optical signal; and

a square law detector (Tsushima et al., PIN photodiode 14 in Fig. 1, col. 5, lines 13-17; note that a PIN photodiode is a square law detector) disposed to receive the combined optical local oscillator signal and optical signal.

Regarding claim 8, Sargis et al. in view of Tsushima et al. and Glance discloses:

The optical communications system of claim 1 further comprising:

an optical wavelength filter (filters in Fig. 1) coupled between the optical splitter and one of the heterodyne receivers.

Regarding claim 9, Sargis et al. in view of Tsushima et al. and Glance discloses:

The optical communications system of claim 1 wherein the tone for each optical signal is located at an optical carrier frequency for the corresponding subband (not shown in the spectrum of Fig. 1 but implied by the four subcarriers).

Regarding claim 12, Sargis et al. in view of Tsushima et al. and Glance discloses:

The optical communications system of claim 1 wherein the frequency component includes a difference component (Tsushima et al., Fig. 3C, col. 6, lines 3-26).

Regarding claim 15, Sargis et al. in view of Tsushima et al. and Glance discloses:

The optical communications system of claim 1 further comprising:

a transmitter subsystem (transmitter side in Fig. 1) for generating the composite optical signal.

Regarding claims 18-24, claims 18, 19, 20, 21, 22, 23, and 24 are method claims that correspond to system claims 1, 2, 3, 4, 5, 7, and 9, respectively. Therefore, the recited means in system claims 1-5, 7, and 9 read on the corresponding steps in method claims 18-24.

Regarding claim 28, Sargis et al. in view of Tsushima et al. and Glance discloses:

The method of claim 18 further comprising:

encoding (Sargis et al., data streams and SCM in Fig. 1) the information in a composite optical signal; and

transmitting (Sargis et al., laser, Mach-Zehnder modulator, and fiber in Fig. 1) the composite optical signal across an optical fiber.

Regarding claim 31, Sargis et al. in view of Tsushima et al. and Glance discloses:

The method of claim 28 wherein the step of encoding the information in a composite optical signal comprises:

receiving an optical carrier.

Sargis et al. in view of Tsushima et al. and Glance does not expressly disclose:

modulating the optical carrier with the information using a raised cosine modulation biased at a point substantially around a V_π point.

However, this modulating is well known in the art for Mach-Zehnder modulators. Sargis et al. in view of Tsushima et al. and Glance discloses the use of a Mach-Zehnder modulator such that the optical carrier is minimized (p. 1658, col. 2, section II). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to modulate the optical carrier of Sargis et al. in view of Tsushima et al. and Glance with the information using a raised cosine modulation biased at a point substantially around a V_π point. One of ordinary skill in the art would have been motivated to do this since doing so is a common way to perform the minimizing of the optical carrier of Sargis et al. in view of Tsushima et al. and Glance. Also, this modulating is preferred for digital applications (note that Sargis et al. in view of Tsushima et al. and Glance teaches the transmission of digital data). On the other hand, biasing at a quadrature point is the other common bias point. The quadrature point is preferred for analog applications.

8. **Claims 10-11 and 25** are rejected under 35 U.S.C. 103(a) as being unpatentable over Sargis et al. in view of Tsushima et al. and Glance as applied to claims 1 and 18 above, and further in view of Hill et al. (U.S. Patent No. 5,546,190).

Regarding claim 10, Sargis et al. in view of Tsushima et al. and Glance does not expressly disclose:

The optical communications system of claim 1 wherein the tone for each optical signal includes a pilot tone located at a frequency other than at an optical carrier frequency for the corresponding subband.

Hill et al. teaches such a pilot tone (Figs. 2-5; col. 2, line 62 – col. 3, line 33; col. 4, lines 12-53; col. 5, lines 21-28; col. 5, line 59 – col. 6, line 11). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to use the pilot tone of Hill et al. in the system of Sargis et al. in view of Tsushima et al. and Glance. One of ordinary skill in the art would have been motivated to do this to add the following features: simultaneously generate subcarrier frequencies for demodulation, the clock signal, and an automatic frequency control signal for the local oscillator (Hill et al., col. 3, lines 28-32).

Regarding claim 11, Sargis et al. in view of Tsushima et al., Glance, and Hill et al. discloses:

The optical communications system of claim 1 wherein at least two optical signals (Hill et al., note the multiple signals with the same pilot tone in Fig. 4) have tones at the same frequency.

Regarding claim 25, claim 25 is a method claim that corresponds to system claim 10. Therefore, the recited means in system claim 10 read on the corresponding steps in method claim 25.

9. **Claims 13-14, 16-17, 26-27, and 29-30** are rejected under 35 U.S.C. 103(a) as being unpatentable over Sargis et al. in view of Tsushima et al. and Glance as applied to claims 1, 15, 18, and 28 above, and further in view of Wong (U.S. Patent No. 6,058,227).

Regarding claim 13, Sargis et al. in view of Tsushima et al. and Glance does not expressly disclose:

The optical communications system of claim 1 wherein the receiver subsystem further comprises:

at least two FDM demultiplexers, each FDM demultiplexer coupled to receive the frequency component from one of the heterodyne receivers for FDM demultiplexing the frequency component into a plurality of electrical low-speed channels.

Wong discloses a transmission method that combines the principles of FDM and WDM (Wong, Fig. 3). This method includes FDM demultiplexers (Wong, power divider 77 and filters in RF Tuners 78 perform FDM demultiplexing). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to modify the system of Sargis et al. in view of Tsushima et al. and Glance to incorporate the combination of FDM and WDM, as taught in Wong. One of ordinary skill in the art would have been motivated to do this to increase the data transmission rates across a transmissions link and to expand the system. That is, the system of Sargis et al. in view of Tsushima et al. and Glance only uses one wavelength. In view of Wong, this system could multiply data transmissions rates by each additional wavelength, thus expanding the system (Wong, abstract, col. 4, lines 17-24).

Regarding claim 14, Sargis et al. in view of Tsushima et al., Glance, and Wong discloses:

The optical communications system of claim 13 wherein the receiver subsystem further comprises:

at least two QAM demodulation stages (Wong, Fig. 5), each QAM demodulation stage coupled to one of the FDM demultiplexers for QAM demodulating the electrical low-speed channels.

Regarding claim 16, Sargis et al. in view of Tsushima et al. and Glance does not expressly disclose:

The optical communications system of claim 15 wherein the transmitter subsystem comprises:

at least two transmitters, each for generating one of the optical signals, each transmitter using a different optical carrier frequency; and

an optical combiner coupled to the transmitters for optically combining the optical signals into the composite optical signal.

Wong discloses a transmission method that combines the principles of FDM and WDM (Wong, Fig. 3). This method includes multiple transmitters (Wong, Figs. 1-2), each for generating one of the optical signals, with different optical carrier frequencies and an optical combiner (Wong, WDM 24 in Fig. 1) coupled to the transmitters for optically combining the optical signals into the composite optical signal. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to modify the system of Sargis et al. in view of Tsushima et al. and Glance to incorporate the combination of FDM and WDM, as taught in Wong. One of ordinary skill in the art would have been motivated to do this to increase the data transmission rates across a transmissions link and to expand the system. That is, the system of Sargis et al. in view of Tsushima et al. and Glance only uses one wavelength. In view of Wong, this system could multiply data transmissions rates by each additional wavelength, thus expanding the system (Wong, abstract, col. 4, lines 17-24).

Regarding claim 17, Sargis et al. in view of Tsushima et al., Glance, and Wong discloses:

The optical communications system of claim 15 wherein the transmitter subsystem comprises:

at least two electrical transmitters (Sargis et al., electrical transmitters not shown but implied by electrical channels in Fig. 1; Wong, transmitter subsystems 80 in Fig. 3) for generating electrical channels;

an FDM multiplexer (Sargis et al., summer in Fig. 1; Wong, FDM in Fig. 3) coupled to the electrical transmitters for FDM multiplexing the electrical channels into an electrical high-speed

channel, the electrical high-speed channel further including the tones (Sargis et al., subcarriers in Fig. 1; Wong, carriers in the transmitter side in Fig. 3); and

an E/O converter (Sargis et al., Mach-Zehnder modulator in Fig. 1; Wong, E/O converter in Fig. 3) coupled to the FDM multiplexer for converting the electrical high-speed channel into the composite optical signal.

Regarding claims 26-27 and 29-30, claims 26, 27, 29, and 30 are method claims that correspond to system claims 13, 14, 16, and 17, respectively. Therefore, the recited means in system claims 13-14 and 16-17 read on the corresponding steps in method claims 26-27 and 29-30.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Fujiwara et al. is cited to show related receiver subsystem, heterodyne receivers, optical splitter, and subbands. Faulkner et al. is cited to show related transmitter and receiver subsystems and heterodyne receivers. Sargis et al. '436 is cited to show related transmitter and receiver subsystems, optical splitter, and subbands. Watanabe is cited to show related transmitter and receiver subsystems, heterodyne receivers, optical splitter, and subbands. Ogata et al. is cited to show related transmitter and receiver subsystems and optical splitter. Bachus et al. is cited to show related transmitter and receiver subsystems, heterodyne receivers, optical splitter, and subbands. Tsukamoto et al. is cited to show related heterodyne receivers and QAM scheme.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David S. Kim whose telephone number is 703-305-6457. The examiner can normally be reached on Mon.-Fri. 9 AM to 5 PM (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 703-305-4729. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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